THE LIFE HISTORY AND DISTRIBUTION OF *RACHELIA EXTRUSA* (C. & R. FELDER) (LEPIDOPTERA: HESPERIIDAE: TRAPEZITINAE) IN AUSTRALIA

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Abstract

The life history of *Rachelia extrusa* (C. & R. Felder) is described and a significant southern range extension to the Rocky River area of Cape York Peninsula recorded. The larval food plant is *Flagellaria indica* L. (Flagellariaceae), occurring as distinct forms under closed canopy rainforests. High levels of egg and larval parasitism are recorded from the Rocky River population. The juvenile stages confirm the morphological links of *Rachelia* Hemming with both the Trapezitinae and Hesperiinae.

Introduction

Rachelia extrusa (C. & R. Felder) was first recorded in Australia from specimens collected at Iron Range, Queensland in May and June 1973 (Atkins 1975). Although six adults have also been collected in Papua New Guinea (Parsons 1999), nothing was known about the juvenile stages or food plants and some speculation has occurred about its taxonomic links (Atkins 1975, Parsons 1999).

Within Australia the species is known from a restricted distribution (Atkins 1975, Braby 2000). All specimens in collections have been taken at a limited number of sites within the Iron Range area, mainly males aggregating at a canopy lek in the vicinity of Gordon Creek. Occasional individuals have also been taken near Mt Tozer and along roadsides within a few square kilometres of the Iron Range Resources Reserve.

Field surveys

In late April 2002, during a field survey at Rocky River (13°49'57"S, 143°27'05"E), an area on the south-eastern edge of the McIlwraith Range about 40 km north of the Silver Plains Station on Cape York Peninsula, Queensland, we discovered an unknown early instar larva. The larva had made a tubular shelter in a leaf of a *Flagellaria indica* L. plant under the rainforest canopy, in habitat situations typical for *Telicota brachydesma* Lower larvae that were present in the same location (Valentine and Johnson, 2000). The larva was taken to Townsville for rearing and by late May its appearance indicated that it was new to present knowledge. The presumed final instar shape appeared somewhat trapezitine although, superficially, it also resembled larvae of Pyrginae and Hesperiinae. We suspected that it was the unknown larva of *R. extrusa* but remained uncertain, in part because this species was not known at Rocky River. On 25 May, 40 hymenopteran parasitoids emerged from the larva and pupated.

Figs 1-5. (1) larval food plant of *R. extrusa*, the distinct low narrow-leaf form of *Flagellaria indica* L. (2-5) juvenile stages of *R. extrusa*: (2) egg; (3) first instar larva; (4) fourth instar larva; (5) final instar larva.

Figs 6-10. Juvenile stages of *R. extrusa*. (6) larval head cap; (7) lateral view of pupa; (8) pupal cap; (9) parasitic emergence from third instar larva; (10) parasitic emergence from final instar larva.

In July 2002 we returned to the Rocky River site to search for more of these larvae. At this stage it was not clear that the species was confined to very specific habitat and to particular forms of *F. indica* and, while a number of hesperiid larval shelters were located, only one specimen of the new larva was found. By late August this second specimen had also succumbed to hymenopteran parasitoids.

In November 2002 we conducted a third search at Rocky River and located additional hesperiid larvae on *F. indica* plants. These were returned to Townsville for rearing. Yet again our efforts were frustrated when some of the larvae proved to be *Telicota augias krefftii* (W.J. Macleay) and remaining larvae were parasitised by different parasitic wasps. However, by now we had correctly identified the preferred forms of *F. indica* for the new larva and we once again returned to Rocky River in early May 2003. On this occasion we were able to locate fresh and parasitised eggs as well as many larvae ranging from first instar to third instar. Despite continuing examples of parasitism we were finally able to rear several larvae through to adults, including one from an egg. During this period we communicated our preliminary findings to Peter Wilson, who undertook searches at Iron Range and located larvae, which were reared to adults (P. Wilson, pers. comm.).

Life History

Food plant (Fig. 1). *Flagellaria indica* L. (Flagellariaceae).

Egg (Fig. 2). Pale pink, hemispherical, 0.9 mm high, 1.2 mm wide at base, 21-25 vertical ribs (n=6).

First instar larva (Fig. 3). Head shining black, slightly narrower at top with slight median sulcus, a few scattered fine setae; body pale yellow with a prominent wedge-shaped black prothoracic plate; abdominal segments with pair of dorsal and ventrolateral setae anteriorly and dorsolateral setae posteriorly; small lateral setae above prolegs; A8 and anal plate with pair of long curved setae posteriorly; spiracles brown. Length 3 mm.

Second and third instar larvae. Head brownish red, pear-shaped with mid-dorsal cleft; pale brown along sulcus and frontoclypeal sutures; frontoclypeus dark brown. Body pale green with dorsal heart edged white from T3 to A9 and dorsolateral white lines from T2 to A9, both lines becoming fragmented into spots on posterior segments; anal plate pink with pink suffusion extending anteriorly onto A8 and 9. Length 6-15 mm.

Fourth instar larva (Fig. 4). Similar to third instar but body pinkish brown.

Final instar larva (Figs 5-6). Head reddish brown; pear-shaped with deep sulcus dorsally producing 2 short horns; pale whitish central stripe from tip of horns along frontoclypeal suture to ventrolateral margin; small central white patch dorsally on frontoclypeus. Body pinkish brown; prothorax pale cream anteriorly and translucent posteriorly; mesothorax deeper pink dorsally;

dorsal heart darker green; faint whitish dorsal and lateral lines. Abdominal segments with transverse lines of small pale white spots and a single prominent white spot on lateral line on each segment; covered in short pale setae with expanded tips; ventrolateral margin of segments 7 and 8 appear scalloped when at rest; anal plate rugose, dark reddish brown, semicircular, narrower than preceding segments and bearing 2 pairs of long pale setae on lateral margin; spiracles whitish. Length 16-25 mm.

Pupa (Figs 7-8). Length 22-24 mm. Cylindrical, tapering gradually to an elongated, slightly decurved dorso-ventrally flattened cremaster with prominent black lateral pits and attached to a stout transverse silken thread. Greyish brown, paler posteriorly; abdominal segments 1-8 with dorsolateral white spots, a pair of white lateral spots on meso and metathorax; spiracles white edged orange brown, body covered in erect straight or slightly curved simple setae some with flattened tips. Prominent semicircular black spiracular plates; dorsal mesonotum, prothorax, antennal bases and ventral mandibular areas white with irregular brown fissures; frons pale brown with prominent dorsal and ventral rugose protrusions, dark patches dorsally, ventrolaterally and on ventral side of dorsal protruberances; attached by strong central girdle across thorax.

Discussion

There are three main forms of *F. indica* at both Iron Range and Rocky River. One is a very thick-stemmed plant that climbs strongly to the canopy and has large coarse leaves. Another form has very fine small leaves and a slightly zig-zag appearance as it climbs a few metres high under the canopy. It has a spindly habit. The third form has small to medium leaves and typically occurs as a low upright or sometimes sprawling plant, usually <1 metre high but sometimes taller. The stems are slightly broader than the zig-zag form but much finer than the giant form. It is possible that this third form is merely a seedling of the giant form, perhaps subject to the common rainforest phenomenon of seedling still-stand. All larvae found to date have been on the smaller forms with a preference at Rocky River for the third form. All three forms may occur in close proximity but the two smaller forms are most common under the rainforest canopy. Queensland Herbarium staff believe all three forms are of the one species (pers. comm., Henderson 1997). In captivity larvae readily accepted all forms.

Eggs are laid on the underside edge of a leaf of the food plant and upon hatching the first instar larva consumes part or all of the eggshell. It then constructs a shelter at the tip of the leaf by silking together a tube, usually joined dorsally. Initial feeding occurs along the edge of this leaf between the shelter and the leaf base. Subsequent shelters may involve one or more leaves joined to form a tube or occasionally the leaf may be doubled back and silked at the edges to form a 'sock'.

In situations where suitable shelters are unable to be formed within leaves of the plant, later instar larvae leave the plant and make shelters in leaf litter near the base of the plant. In captivity provision of dried leaves at the base of small potted plants led to final instar occupation and silking of these dried leaves into shelters much like that of a typical off-plant shelter of *Trapezites* Hübner species. Larvae pupated in these dried leaf shelters and fashioned silk thoracic girdles and attached the cremaster to a strong lateral posterior line. Pupal duration of captive reared larvae was 17-21 days in Townsville in June/July and 17 and 19 days in Bundaberg in September and May respectively. During May to July in Townsville it took 54 days from egg to pupa.

Fig. 11. Underside of freshly emerged adult male *R. extrusa* from Rocky River, showing dense hairs.

The form of the egg and pupa is consistent with that seen in Trapezitinae, especially *Trapezites* spp., but the larval form and presence of a strong central girdle in the pupa are closer to *Notocrypta* de Niceville spp. (Hesperiinae). It is interesting to note the comment in Parsons (1999) that a sketch by Brandt of the unknown food plant of *Notocrypta aluensis* Swinhoe appears to show *F. indica.*

The preferred habitat of larval *R. extrusa* is on small *F. indica* plants (Fig. 1) growing under closed canopy rainforest. All eggs and larvae found to date at both locations have been within 500-700 mm of the ground and small plants are often denuded of leaves by developing larvae.

The level of parasitism in the Rocky River population of *R. extrusa* seems remarkably high. We observed parasitism in eggs, early instar larvae and final instar larvae (Figs 9-10). One possible explanation may be the more open nature of the habitat for *R. extrusa*. Many of the locations where larvae were found at Rocky River had very limited undergrowth and the *F. indica* plants were prominent against a relatively bare ground (in several cases even more so where leaf litter was swept into the nest mounds of Yellow-footed Scrub-hens). Identification of the parasitoids to species has not been possible and voucher specimens have been lodged in the Queensland Museum. There are two families represented, Eulophidae and Braconidae (M. Elson-Harris, pers. comm.).

The absence of adults paralleled our experience with *T. brachydesma* in that even when large numbers of larvae were found, no adults were encountered. In many visits to Rocky River only one adult *T. brachydesma* has so far been encountered, despite many hundreds of larvae being seen. It is likely that in both species the low light conditions under the canopy and the cryptic colouration of the adults precludes easy observation of females laying eggs. Males in both cases are likely to be in the upper canopy. In the case of *R. extrusa* this is certainly true at Iron Range. Further surveys at Rocky River are required to discover male leks. Freshly emerged adults are particularly hairy in the ventral thoracic region and on their legs (Fig. 11).

Sands and New (2002) considered *R. extrusa* to be of 'no conservation concern' despite its extremely limited distribution and unknown life history. Our significant range extension and life history discovery enhance the basis by which its conservation status may be assessed. *F. indica* occurs commonly in rainforests throughout Torres Strait and Cape York Peninsula and *R. extrusa* may well have a wider distribution within Australia than is currently known. There is no evidence of any direct anthropogenic threats to the species; however, occasional minor food plant damage from feral cattle and pigs is evident at Rocky River. Given the above and the current plans for the McIlwraith Range to be gazetted as a protected area (QPWS, pers. comm.) we agree with the Sands and New (2002) assessment.

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